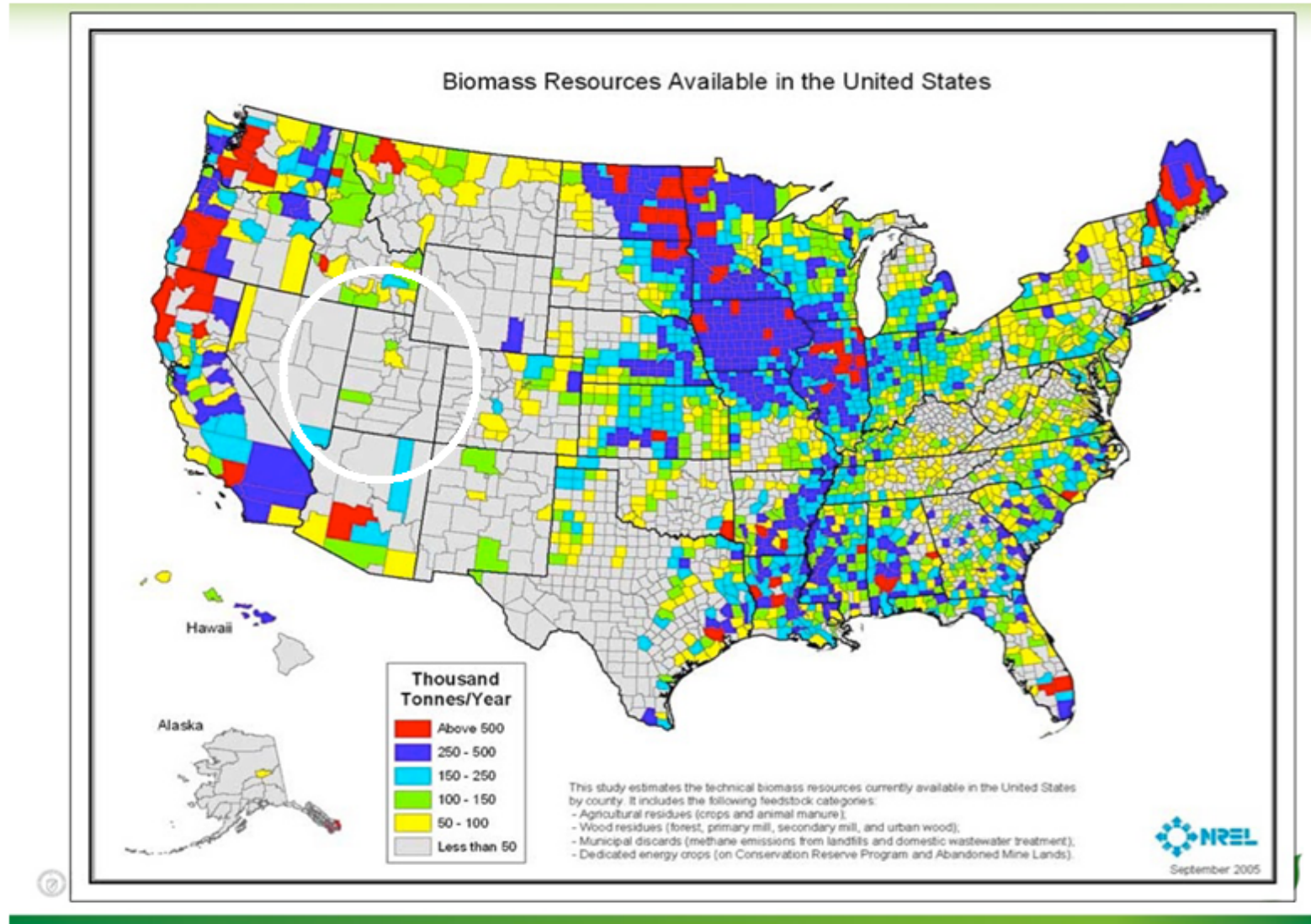


- Objectives
 - Promote Utah Woodland Health/Management Goals
 - Facilitate the Utilization of Biomass (Woody)
 - Assist in establishing a biomass market in Utah
 - Create Utah biomass utilization jobs
 - Form partnerships to develop rapid/responsible biomass utilization
 - Identify appropriate technology and scale for biomass utilization for bioenergy

Traditional Thought - Great Basin Biomass



Hogan
Ranch 1902-
A. Potter



Hogan Ranch
1995 –
Charles Kay



Danish
Meadows
1902-
A. Potter



Danish
Meadows
2002 –
Charles Kay

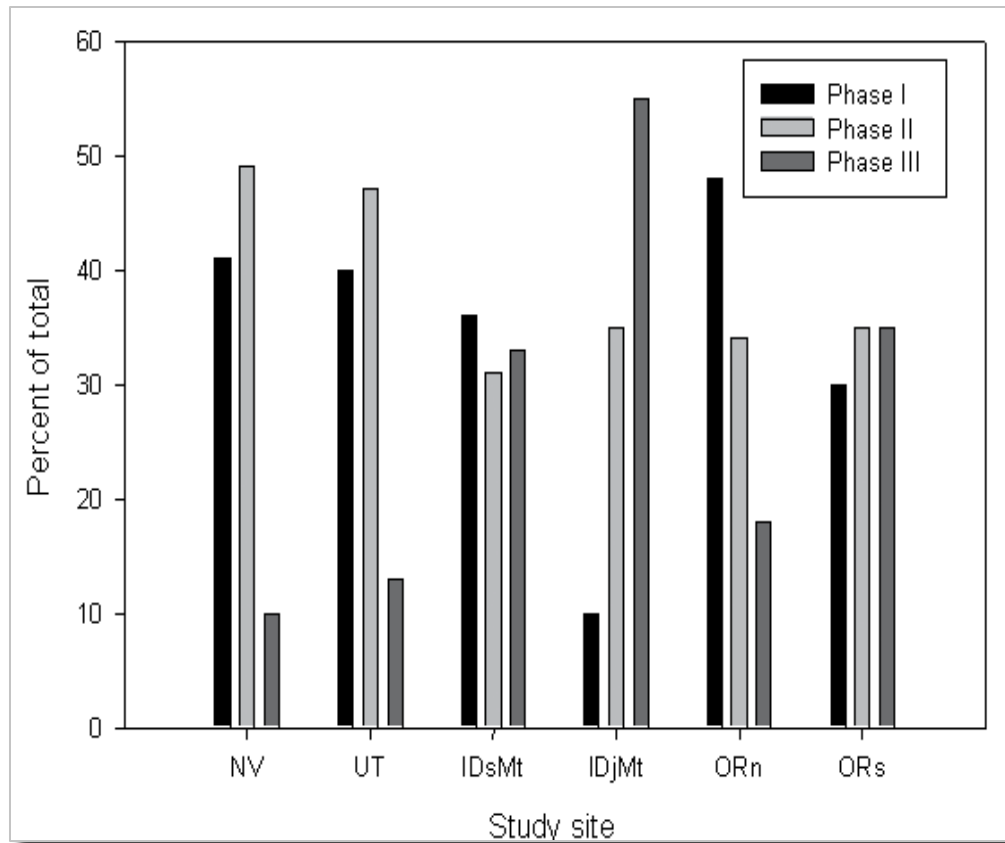


Significant Nuisance Biomass

- Utah Pinyon Juniper
 - 9 million acres at 10 ton/acre = 90 million tons
 - Considered an ecosystem changer
 - 75% of PJ forests will 3X their biomass in the next 50 years
- Great Basin Pinyon Juniper
 - 45 million acres
 - @450 million tons



Pinyon Juniper



Phase I: Trees are present

Phase II: Trees are co-dominant
with shrubs and herbs

Phase III: Trees are dominant
vegetation

How does this affect us

- Uncontrolled invasion of PJ
 - Destroys wildlife habitat
 - Increases risk of fire
 - If fire occurs in a mature PJ forest -
 - Water shed disruption
 - Loss of ecosystem due to increased fire temperatures
 - Invasion of exotic annuals that are more prone to fire

Pattern of Understory Decline Over Time With the Increase in Pinyon/Juniper Dominance



Tree Dominance =

Low

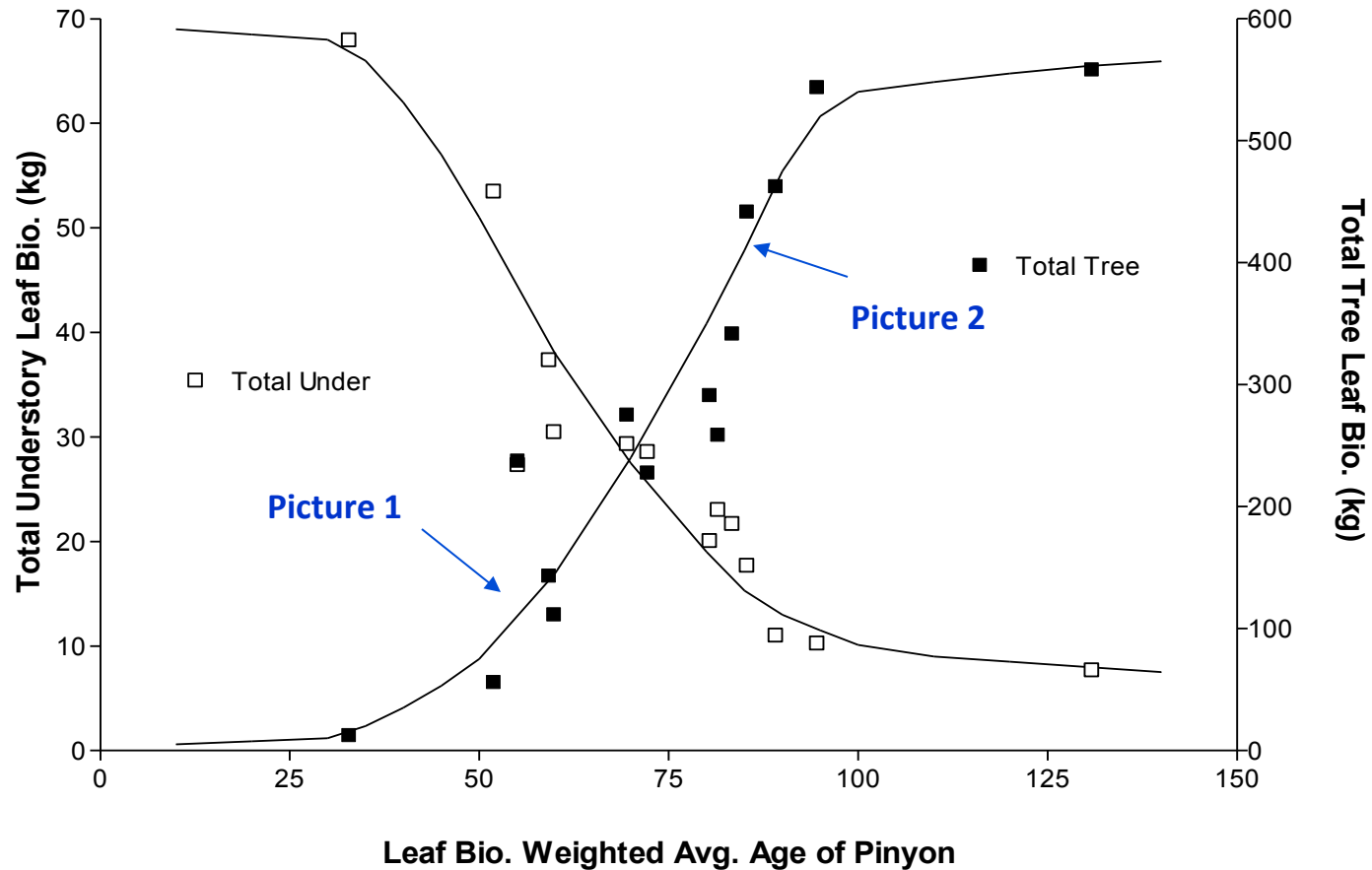
Mid

High

Phase 1

Phase 2

Phase 3



Courtesy of Taush 2012



**Cathedral Burn, White Pine Range, Nevada, Mid-June, 2008 (Burned Mid-July 2007)
2,000 Acres burned in 5 hours**

Courtesy of Taush 2012

Conventional Thinking



"Problems cannot be solved by the same level of thinking that created them."

37 Years of Changes on the North Kern East Chaining, NE Nevada

Hillside has mostly Phase I and some Phase II

1971

Chained in 1969



After 37 years the hillside is mostly Phase III with some Phase II

2008

39 years of re-growth of trees surviving chaining
Now nearing the end of Phase II



Looking Forward

- Assume 3 million PJ treated acres in Utah (7 tons of biomass/acre)
 - Net pyrolysis products/acre
 - 2.3 tons of bio char
 - 12.5 barrels of bio oil
 - Net revenue/acre
 - Biochar @ \$600/ton = \$1380/acre
 - Bio oil @ \$30/barrel = \$375/acre

Benefits?

- Create a new industry in Utah
 - 1 person = 85 acres/year
 - 35 year cycle = 85000 acres/year
 - 1000 new jobs in Utah (just in treatment)
- Displace petroleum/coal heating energy
 - 6 million tons
- Decrease Emissions
 - Renewable energy
 - Cleaner emissions
- Solve Ecosystem Problem
 - Decrease fire risk
 - Habitat/Open space displacement

Harvesting Equipment Study



- Woody biomass harvesting equipment tested on PJ

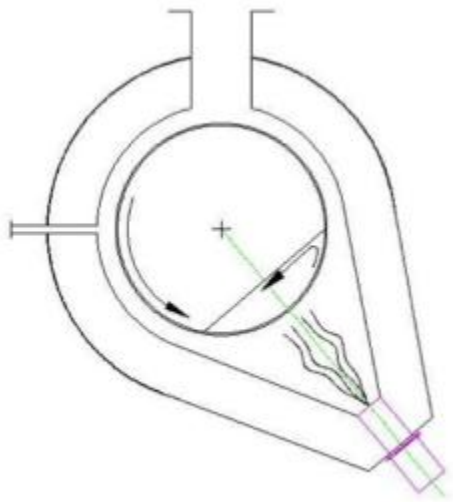
- Gives baseline to start from



- Cooperative effort with Dr. Bob Rummer, USFS and Lance Linbloom, Blooming Ranch Services

Pyrolysis Technology – Rotary Kiln

- Traditional methods of fast pyrolysis for biomass are complex and expensive.
- Amaron Energy /University of Utah are developing a simple, inexpensive process to achieve fast pyrolysis with a precision-controlled indirectly-fired rotary kiln.



Patent Pending



USDA ARS Forage and Range Laboratory Partnership

- Identified a team of researchers to collaborate
- Investigate new paradigms of land use
- Investigate BMP's for vegetation establishment



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